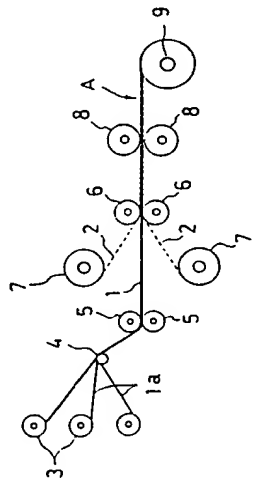
(54) FIBROUS MATTER REINFOR[illegible]G SHEET FOR REINFORCED PLASTIC
(11) 3-234522 (A) (43) 18.10.1991 (19) JP
(21) Appl. No. 2-30907 (22) 9.2.1990
(71) NIPPO SANGYO K.K. (72) ATSUO TAKEUCHI
(51) Int. Cl⁵. B29C67/14,B32B5/00,B32B5/26,B32B17/02,D04H5/06

PURPOSE: To constitute the title sheet so that gaps are not generated between parallel fibers, by a method wherein long fibers arranged in parallel with one another to form a sheet are connected with one another by making use of a heat-fusing sheet provided with a form of nonwoven fabric or braided fabric which is extremely thin and is loose.

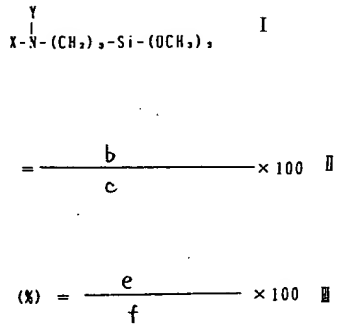
CONSTITUTION: When a fiber sheet 1 where heat-fusing sheet 2,2 are caused to run respectively along both the front and rear is forced to pass through between a pair of hot press rollers 8, 8 the hot-melt heat-fusing sheets 2 are pressed against both the surfaces and the heat-fusing sheet 2 is cooled and solidified swiftly after passing through between the hot press rollers 8, 8. Therefore, a large number of long fibers 1a constituting the fiber sheet 1 become a state where they are connected with one another by the heat-fusing sheet 2 in a state of nonwoven fabric, a form of the sheet is set, a desired fibrous matter reinforcing sheet A is completed and wound up round a wind-up shaft 9 of a product. With this construction, it becomes that gaps are not generated among the fibers drawn up in a line. A lump of an adhesive agent stucks to a lateral fiber along the lateral fiber lies scattered concentratively locally within a fiber-reinforced plastic molded product and also lowering of strength of the whole of the product is eliminated.



(54) ORIENTED POLYESTER FILM
(11) 3-234523 (A) (43) 18.10.1991 (19) JP
(21) Appl. No. 2-29957 (22) 9.2.1990
(71) TOYOBO CO LTD(1) (72) YASUHIRO NISHINO(3)
(51) Int. Cl⁵. B29C67/16//B29K105/16

PURPOSE: To obtain an oriented polyester film which is smooth and superior in wear resistance and slidability, by a method wherein inactive inorganic particles obtained by modifying the surfaces of the inactive inorganic particles, whose mean particle diameter is specified, with a specific multifunctional silane coupling agent are contained at a specific ratio.

CONSTITUTION: Inactive inorganic particles obtained by modifying the surfaces of the inactive inorganic particles, whose mean particle diameter is 0.1-2.0μm, by a multifunctional silane coupling agent shown by a formula I are contained at the ratio of 0.01-0.50wt.%. In the formula I, X and Y show an organic group possessing a functional group capable of performing cavalent bonding with polyester oligomer which can form polyester and kinds of them may be the same as each other or different from each other. Hereupon, an area ratio (%)of the inactive inorganic particles to a circumscribed circle defined by a formula II is at least 60% and it is preferable that a degree of dispersion of a particle diameter defined by a formula III is 30% or less. With this construction, a polyester film which is smooth, superior in slidability and wear resistance and extremely free from generation of white powder or coarse particles which are the cause of generation of defects such as dropouts can be obtained.

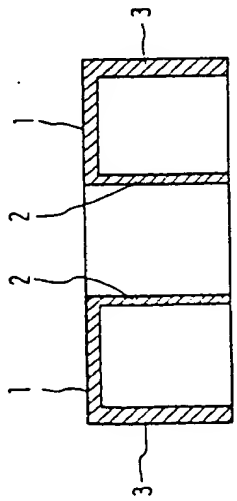


a: area ratio to circumscribed circle, b: projected sectional area of particle diameter, c: area of circle circumscribing with a particle, d: degree of dispersion of particle diameter, e: standard deviation of particle diameter, f: mean particle diameter

(54) RESIN MOLDING
(11) 3-234524 (A) (43) 18.10.1991 (19) JP
(21) Appl. No. 2-30198 (22) 9.2.1990
(71) MATSUSHITA ELECTRIC IND CO LTD (72) NORIYUKI KAINO(1)
(51) Int. Cl⁵. B29D22/00,B29C45/00

PURPOSE: To contrive a reduction of a warp quantity within the top after mold release by accelerating cooling of a rib of an inner circumference or an inside rib and mitigating nonuniform cooling, solidification and contraction of the top, by a method wherein a thickness of an inner circumferential side or a thickness of an inside rib of a branch part of a hollow molding is molded thin as compared with a thickness of an outer circumference or a thickness of an outside rib of the same.

CONSTITUTION: A thickness of an inner circumferential side or a thickness of an inside rib 2 of a branch part of a hollow molded product is molded thin as compared with a thickness of an outer circumference or a thickness of an outside rib 3 of the same. With this construction, a warp quantity within the top 1 after mold release can be reduced by accelerating cooling of an inner circumferential surface or the inside rib 2 of a molded product and mitigating nonuniform cooling, solidification and contraction. Therefore, a molding where the warp quantity of the top 1 of a hollow resin molding possessing a U-shaped branch part is reduced can be obtained.



PATENT ABSTRACTS OF JAPAN

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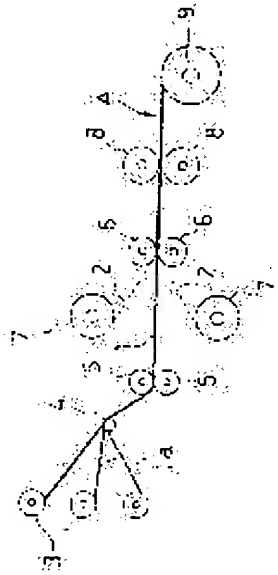
(71)Applicant : NIPPO SANGYO KK

(72)Inventor : TAKEUCHI ATSUO

(54) FIBROUS MATTER REINFORCING SHEET FOR REINFORCED PLASTIC

(57)Abstract:

PURPOSE: To constitute the title sheet so that gaps are not generated between parallel fibers, by a method wherein long fibers arranged in parallel with one another to form a sheet are connected with one another by making use of a heat-fusing sheet provided with a form of nonwoven fabric or braided fabric which is extremely thin and is loose.



CONSTITUTION: When a fiber sheet 1 where heat-fusing sheet 2,2 are caused to run respectively along both the front and rear is forced to pass through between a pair of hot press rollers 8, 8 the hot-melt heat-fusing sheets 2 are pressed against both the surfaces and the heat-fusing sheet 2 is cooled and solidified swiftly after passing through between the hot press rollers 8, 8. Therefore, a large number of long fibers 1a constituting the fiber sheet 1 become a state where they are connected with one another by the heat-fusing sheet 2 in a state of nonwoven fabric, a form of the sheet is set, a desired fibrous matter reinforcing sheet A is completed and wound up round a wind-up shaft 9 of a product. With this construction, it becomes that gaps are not generated among the fibers drawn up in a line. A lump of an adhesive agent stucks to a lateral fiber along the lateral fiber lies scattered concentratively locally within a fiber-reinforced plastic molded product and also lowering of strength of the whole of the product is eliminated.

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[Patent number]

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5/26		7016−4F
17/02		7148−4F
D 04 H 5/06		7438−4L

⑬公開　平成3年(1991)10月18日

審査請求　未請求　請求項の数 1　(全5頁)

⑭発明の名称　強化プラスチック用の繊維質補強シート

⑳特　願　平2−30907
㉒出　願　平2(1990)2月9日

⑫発明者　武内　醇雄　愛知県名古屋市千種区千代が丘1番110−110
⑪出願人　日邦産業株式会社　大阪府吹田市江坂町1丁目23番28−701号
⑭代理人　弁理士　松波　祥文

明　細　書

1．発明の名称

強化プラスチック用の繊維質補強シート

2．特許請求の範囲

(1) ガラス繊維、カーボン繊維、アラミド樹脂繊維等の長繊維1aを、その長手方向に平行状に密接配列してシート状に形成し、この繊維シート1の片面又は両面に、熱溶融性を有する繊維を互いに交絡させて薄く薄厚で目の粗い不織布状乃至網組布状に形成した熱融着性シート材2を熱融着させて成る強化プラスチック用の繊維質補強シート。

3．発明の詳細な説明

[発明の目的]

(産業上の利用分野)

本発明は、ガラス、カーボン、アラミド樹脂等から成る長繊維を、その長手方向に互いに平行状に密接配列してシート状に形成し、このシート形状を接着手段により固定させた形態を備える、強化プラスチック用の繊維質補強シートに関する。

(従来の技術)

ガラス繊維、カーボン繊維、或いはアラミド樹脂繊維等を埋蔵させてその機械強度を向上させた、所謂繊維強化プラスチックは、鉄に比べて遥かに軽く且つ成形性が優れている上に、鉄に匹敵する強度が得られて、然も錆びないので、産業界の各分野に広く採り入れられている。

このプラスチック強化用の繊維は、織布又は不織布の形態にして、プラスチックの成形時に包埋させるのが一般的な使用方法である。

然し、成形製品の一方向に特に高強度(引張、屈曲強度)を求められる、例えば、ヘリコプターや発電機の羽根、或いは円筒状のタンク類等を成形する場合には、繊維の長手方向を引張応力の作用する方向に平行状に密接配列してシート状にし、このシート状基材に液状の樹脂を含浸、硬化させて所望の形状に成形し、成形製品の強度を高める方法が採られている。

そして、プラスチック補強用繊維を予めシート状に賦形させたものとして、平行状繊維の相互を、

連結用横繊維によって膜状又は布状に編んで連結した構成の、補強用繊維シートが用いられていた。

或いは、第４図及び５図に示した様に、縦繊維５８を平行状に密接配列してシート状に形成し、この縦繊維５８相互を連結させる為に、所定間隔を隔てて連結用の横繊維５１を配置し、この横繊維５１を、接着剤５２を使って縦繊維５８に固着させた構成のものも作られていた。

（発明が解決しようとする課題）

然し乍ら、上記膜状に形成したものは、その織り目部分に隙間が生じてこの部分は繊維が欠如するので、この状態で繊維シートを包埋させた強化プラスチック成形製品は、ガラス繊維によって補強されないプラスチックの境状部分が生じる為、強い応力が及ぼされた場合に、この繊維欠如部分に応力亀裂が生じて、繊維で強化された部分より遥かに低い応力で破壊に至る恐れがあった。

又、横方向の連結用繊維を縦繊維に接着させたものは、接着剤５２が成形プラスチック製品の内部に局部集中的に散在されて、この部分が、上記と同様の理由で局部的に強度低下するので、成形製品全体の強度低下を招いていた。

更に、上記の膜状に編組したものは、編組の為の特別な技術と装置を必要とするので、その分、製造コストが上昇する難点があった。この様な欠点は、上記の接着方法によるものにも共通して存在する。

そこで、本発明の目的は、長繊維を互いに平行状に密接配列してシート状に形成しこのシート形状を固定させたものに於いて、上記従来のものの欠点が概ね解消された、強化プラスック用の繊維質補強シートを提供するにある。

〔発明の構成〕

（課題を解決するための手段）

上記の目的を達成する為に、本発明による強化プラスチック用の繊維質補強用シートは、

ガラス繊維、カーボン繊維、アラミド樹脂繊維等の長繊維１ａを、その長手方向に平行状に密接配列してシート状に形成し、この繊維シート１の片面又は両面に、熱溶融性を有する繊維を互いに交絡させて極く薄厚で目の粗い不織布状乃至編組布状に形成した熱融着性シート材２を熱融着させた構成とした。

（作　用）

長繊維１ａを、その長手方向に平行状に密接配列して形成された繊維シート１は、その片面又は両面に熱融着された不織布状乃至編組布状の熱融着性シート２によって、液状樹脂を含浸・硬化させる迄、そのシートの形状を保持される。

そして、その無数の熱融着個所は、繊維シート１の全面に亘って略均等に分布される。

（実　施　例）

以下に、第１図乃至第３図を参照し乍ら本発明の一実施例を説明する。

先ず、本発明の繊維質補強シートＡを、その各構成要素に分離して示した第２図に於いて、１ａは長繊維で、ガラス繊維、カーボン繊維、アラミド樹脂繊維等のモノフィラメント、又はこのモノフィラメントを複数本束ねた繊維から成り、その長手方向に互いに平行状に密接配列して所要面積の繊維シート１を形成させている。

２は熱融着性シートで、この場合は、国内の有力化学製品メーカーの１つである　Kureha Ltd が、「ダイナック」の商品名を付して製造・販売している熱融着用シートを用いている。

この熱融着性シート２は、ポリステル、ポリアミド、ポリオレフィン等の熱溶融性合成樹脂の極く細いモノフィラメントを、その押出ノズルから吐出せる際に、フィラメント相互を交絡させることによって、極く粗目で、厚さも極く薄い不織布状に形成されている。その融点は、樹脂の種類によって異り、９０～１４５℃内外である。

上記の繊維シート１と熱融着性シート２とを素材にして、第１図に示した断面構成を備える繊維質補強シートＡを製造するには、例えば、第３図に示した製法による。

即ち、多数個のボビン３から夫々繰り出された長繊維１ａをガイドバー４及び１対のガイドローラ５，５を通すことによって、所定幅を持った長尺の繊維シート１を連続的に形成させる。

この繊維シート1は、1対の押さえローラ6，6の間を通過させられる際に、繊維シート1の表裏両面の全面に亙って熱融着性シート2，2が沿わされる。7，7はこの熱融着性シート2，2を供給する巻軸である。

表裏両面に夫々熱融着性シート2，2を沿わされた繊維シート1は、1対の熱圧ローラ8，8の間を通過させられる際に、熱溶融した熱融着性シート2を両表面に押し付けられ、熱圧ローラ8，8の通過後にこの熱融着性シート2は急速に冷却固化される。

その為、繊維シート1を構成する多数本の長繊維1aは、不織布状の熱融着性シート2によって互いに連結された状態となってそのシート形状が固定されて、所望の繊維質補強シートAが出来上がり、製品の巻取軸9に巻き取られる。

この様な構成を備えた繊維質補強シートAは、その全面に亙って略均等な分布を以て熱融着された熱融着性シート2が方向性を有しないので、従来の、横繊維により織状に編まれたものとは異なって、並列された繊維間に隙間が出来てしまうと　った不都合は全く生じない。

又、並列された縦繊維に横繊維を接着した構成の従来のものの欠点である、横繊維に沿って付された接着剤の塊りが、繊維強化プラスチック成形製品の内部に局部集中的に散在されて、製品全体の強度を低下させると言うことも無くなる。

尚、上記構成に於い、繊維シート1への熱融着性シート2の融着方法は、例えば、熱圧ローラ8に代えて単なる押圧ローラを用い、その前方に設けたヒータによって繊維シート1の表面を熱融着性シート2の融点以上に加熱する等、適宜に選定すれば良い。

又、熱融着性シート2は、上記「ダイナック」の様に不織布状でなくて、繊維の配向方向が例えば縦横に整列された、目の粗い網組布状のものであっても良い。

更に、熱融着性シート2は、繊維シート1の全面ではなくて、部分的に、例えば縞状に宛てがっても良い。

そして、熱融着性シート2の材質は上記のものに限られず、他の熱融着性材料を適宜に選定しても良く、必要に応じて熱融着性を有しない又は融点が互いに相異する複数種類の繊維と混ぜ合わせて作られた熱融着性シート2を用いても良い。

更には、熱融着性シート2の素材として、強化プラスチック成形用の樹脂原液中の溶剤、例えば不飽和ポリエステル樹脂中のスチレンモノマー等に化学的に溶かされるものを用いれば、強化基材と硬化樹脂のみで構成された強化プラスチック成形品を得ることが出来る。

その為、従来のものの様に、接着剤が成形製品中に異物として局部的に混入されることに基づく、製品の強度低下は起こり得なくなる。

[発明の効果]

以上の説明によって明らかな様に、本発明による強化プラスチック用の繊維質補強シートは、シートを形成させる　に互いに平行状に配列された長繊維相互を、極く薄厚で目の粗い不織布乃至網組布の形態を備えた熱融　性シートを用いて、熱溶着により連結しているので、従来の織状に編組されたものの様に、並列繊維間に隙間が出来る不具合を生じない。

又、並列縦繊維にその連結用の横繊維を接着した構成の従来のものと異なって、並列繊維相互の接着剤として働く熱融着シートは、従来のものとは異なって、不要な樹脂塊を生ぜず、その平面方向の組織が略均等に保たれる。

その為、この繊維質補強シートを用いて作られた強化プラスチック成形製品は、従来のものの様に、接着剤が局部的に集中した状態で散在される(第5図参照)ことに由来する、製品全体の強度低下を招かなくて済む。

その上、繊維質補強シートは、繊維シートの表面に熱融着性シートを加熱し乍ら押し付けるだけで出来上がるので、その製造コストは前記従来のものに比べて遥かに安くなり、且つ均質な製品を得られ易い等、様々の優れた効果を奏する。

4．図面の簡　な説明

第1図乃至第3図は、本発明の一実施例を示す

もので、第１図は部分拡大縦断面図、第２図は繊維シートと熱融　性シートとを分離して示す部分拡大斜視図、第３図は製造工程を例示した見取図である。

第４図及び第５図は、従来例を示す斜視図及び縦断面図である。

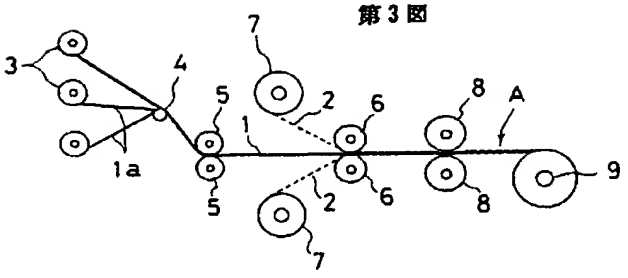
符　号　表

A	繊維質補強シート		
1	繊維シート	1a	長繊維
2	熱融着性シート	3	ボビン
4	ガイドバー	5	ガイドローラ
6	押さえローラ	7	巻軸
8	熱圧ローラ	9	巻取軸
50	縦繊維	51	横繊維
52	接着剤		

出願人　日　邦　産　業　株　式　会　社

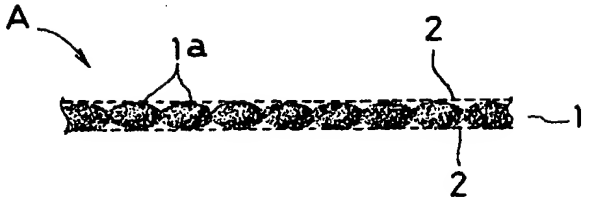
代理人　弁理士　松　波　祥　文

第３図

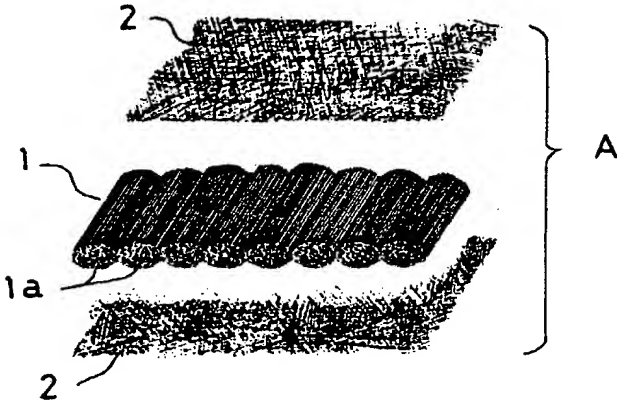


図面の浄書

第１図



第２図



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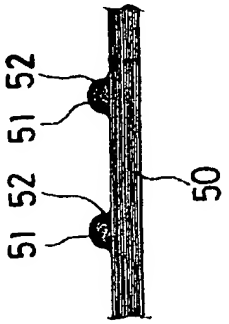

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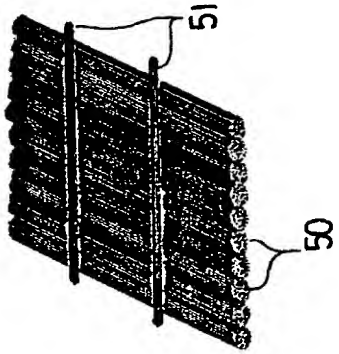

手続補正書(方式)

平成2年6月27日

特許庁長官　吉田　文毅　殿

1．事件の表示
　平成2年特許願第30807号

2．発明の名称
　強化プラスチック用の繊維質補強シート

3．補正をする者
　事件との関係　特許出願人
　住　所　大阪府吹田市江坂町一丁目23番28-701号
　名　称　日邦産業株式会社
　代表者　岡屋裕造

4．代理人　〒460
　住　所　名古屋市中区千代田2丁目19番4号
　氏　名　弁理士（6866）松波祥文

5．補正命令の日付
　平成2年5月29日

6．補正の対象
　添付図面の第1．2．4．5図

7．補正の内容
　別紙の通り

2.6.26 出願 山本

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(72) Inventor: Sumio TAKEUCHI
1-110-110, Chiyogaoka, Chitose-ku, Nagoya-shi, Aichi-ken

(71) Applicant: Nippo Sangyo Kabushiki Kaisha
23-28-701, Esaka-cho 1-chome, Suita-shi, Osaka

(74) Agent: Attorney, Akifumi MATSUNAMI

SPECIFICATION

1. Title of the Invention

FIBER-REINFORCING SHEET FOR REINFORCED PLASTICS

2. Claim

(1) A fiber-reinforcing sheet for reinforced plastics comprising continuous fibers 1a such as glass fibers, carbon fibers, and aramid resin fibers that are densely arranged in parallel in the longitudinal direction into a sheet, and a heat-bondable sheet 2 that is an ultrathin and loose nonwoven or knitted fabric formed by entanglement of heat-bondable fibers heat-bonded to one face or two faces of the

fiber sheet 1.

3. Detailed Description of the Invention

[Object of the Invention]

(Technical Field of the Invention)

The present invention relates to a fiber reinforcing sheet for reinforced plastics that includes continuous fibers such as glass fibers, carbon fibers, and aramid resin fibers that are densely arranged in parallel in the longitudinal direction into a sheet that is fixed by a bonding means.

(Related Art)

Fiber-reinforced plastics containing embedded glass fibers, carbon fibers, or aramid resin fibers and having improved mechanical strength are significantly superior to iron in processability, have strength comparing with that of iron, and do not rust; hence they are widely used in various industrial fields.

The fibers for reinforcing plastics are generally used in a form of woven or nonwoven fabric and embedded during shaping of the plastics.

In the formation of, for example, blades for helicopters or electric generators and walls of cylindrical tanks that require particularly high strength (tensile strength and bending strength) in one direction of the molded products, the longitudinal directions of the fibers

are densely arranged in parallel in a direction to which tensile strength is applied into a sheet that is impregnated with a liquid resin. The liquid resin is cured to form a molded product having enhanced strength.

As sheets formed by preliminary shaping of plastic-reinforcing fibers, reinforcing fiber sheets of which parallel fibers are mutually connected with connecting fibers into a cord or cloth have been used.

Alternatively, as shown in Figs. 4 and 5, longitudinal fibers 50 are densely arranged in parallel to form a sheet. To connect the longitudinal fibers 50 mutually, lateral fibers 51 for connection are arranged at a predetermined interval, the lateral fibers 51 being bonded to the longitudinal fibers 50 with bonding agents 52.

(Problems to be solved by the Invention)

However, the cord fabric inevitably forms gaps at the connections, and no fiber is provided at the gaps. Since a reinforced plastic product in which this fiber sheet is embedded has pure plastic portions not reinforced glass fibers, a strong stress applied to the plastic portions not containing the fibers causes stress cracking of these portions. Thus, these portions would be ruptured at a significantly lower stress compared with fiber-reinforced portions.

In the bonding of the lateral connecting fibers to the

longitudinal fibers, the bonding agents 52 are localized inside the molded plastic product, and the strength of these portions is intensively decreased by the above-mentioned reason, resulting in decreased strength of the product on the whole.

Furthermore, the above cord knit requires a special technology and apparatus, resulting in undesirably increased production cost. The above bonding method also has such an issue.

An object of the present invention is to provide a fiber-reinforcing sheet for reinforced plastics that includes continuous fibers that are densely arranged in parallel in the longitudinal direction into a sheet that is fixed. Thereby, the above problems of known technologies are substantially solved.

[Description of the Invention]

(Solving Means)

A fiber-reinforcing sheet for reinforced plastics according to the present invention, for achieving the above object, comprises continuous fibers 1a such as glass fibers, carbon fibers, and aramid resin fibers that are densely arranged in parallel in the longitudinal direction into a sheet, and a heat-bondable sheet 2 that is an ultrathin loose nonwoven or knitted fabric formed by entanglement of heat-bondable fibers heat-bonded to one face or two faces of

the fiber sheet 1.

(Operation)

The shape of a fiber sheet 1 formed by densely arranging continuous fibers 1a parallel to the longitudinal direction is maintained with a nonwoven or knitted fabric heat-bondable sheet 2 heat-bonded to one face or two faces of the fiber sheet until a liquid resin is impregnated and cured.

Numerous heat-bonded portions are uniformly distributed over the entire surface of the fabric sheet 1.

(Embodiments)

An embodiment of the present invention will now be described with reference to Figs. 1 to 3.

In Fig. 2 that separately shows components of a fiber reinforcing sheet A according to the present invention, reference numeral 1a represents a long fiber composed of a monofilament of glass fiber, carbon fiber, or aramid resin fiber or a strand of a plurality of the monofilaments. The continuous fibers are densely arranged in parallel in the longitudinal direction to form a fiber sheet 1 having a required area.

Reference numeral 2 is a heat-bondable sheet. In this embodiment, a heat-bondable sheet "Dynac" commercially available from Kureha Ltd., one of the leading chemical companies is used.

The heat-bondable sheet 2 is a thin and loose nonwoven fabric that is formed by entanglement of very thin filaments of thermoplastic synthetic resins such as polyester, polyamide, and polyolefin that are extruded from extrusion nozzles. The melting point, which depends on the type of the resin, is about 90°C to about 145°C.

The fiber reinforcing sheet A having a cross section shown in Fig. 1 is prepared using the fiber sheet 1 and the heat-bondable sheet 2, for example, by a method shown in Fig. 3.

Continuous fibers 1a unwound from many bobbins 3 pass through a guide bar 4 and a pair of guide rollers 5,5 to continuously form a long fiber sheet 1 with a predetermined width.

The fiber sheet 1 with heat-bondable sheets 2,2 on the both entire faces of the fiber sheet 1 passes through between a pair of pressure rollers 6,6. Reference numerals 7 and 7 represent scrolls that supply the heat-bondable sheets 2,2.

The fiber sheet 1 with the heat-bondable sheets 2,2 on the both entire faces pass through between a pair of hot rollers 8,8 while the heat-bondable sheets 2 are being pressed toward the both surfaces. After passing through the hot rollers 8,8, the heat-bondable sheets 2 are rapidly

cooled for solidification.

As a result, many continuous fibers 1a of the fiber sheet 1 are mutually connected by the nonwoven fabric heat-bondable sheet 2 to fix the sheet, and the resulting fiber sheet A is wound up around a winding scroll 9.

In the fiber reinforcing sheet A having such a structure, the heat-bondable sheets 2 uniformly heat-bonded on the entire surfaces have no directivity. Thus, the fiber reinforcing sheet A, which quite differs from conventional cord knits using lateral fibers, does not have a disadvantage that gaps are formed between arranged fibers.

Furthermore, the fiber reinforcing sheet A does not have a disadvantage of a conventional structure including parallel longitudinal fibers bonded with lateral fibers, namely, blocks of a bonding agent adhering along the lateral fibers are localized inside of the fiber-reinforced plastic molded product.

With this structure, the heat-bondable sheets 2 may be heat-bonded to the fiber sheet 1, by any method, for example, by heating the surfaces of the fiber sheet 1 to a temperature above the melting point of the heat-bondable sheet 2 with a heater provided upstream of a roller which is used in place of the hot roller 8.

The heat-bondable sheet 2 may not be the nonwoven fabric such as "Dynack", but may be a loose knit fabric in which fibers are arranged, for example, vertically and horizontally.

The heat-bondable sheet 2 may be partially placed on the surfaces of the fiber sheet 1, for example, into an island shape, instead of the entire surfaces.

Materials for the heat-bondable sheet 2 are not limited to the above description and may be any other heat-bondable materials. Alternatively, the heat-bondable sheet 2 may contain a plurality of fibers that do not have heat-bondability or have different melting points, if necessary.

In addition, the heat-bondable sheet 2 may contain a solvent of a resin stock solution for reinforced plastic molding, for example, styrene monomer chemically dissolved in an unsaturated polyester resin to prepare a reinforced plastic molded product composed of only a reinforcing substrate and a curable resin.

As a result, a decrease in strength of the product based on the bonding agents as foreign materials localized in the molded product does not occur, unlike conventional products.

[Advantages]

As described above, the fiber reinforcing sheet for

reinforced plastics according to the present invention includes continuous fibers densely arranged in parallel in the longitudinal direction into a sheet and fixed with heat-bondable sheet of a very thin loose nonwoven or knitted fabric by heat heat-bonding. Thus, no gap is formed between parallel fibers, unlike conventional cord fabrics.

The heat-bondable sheet, which functions as a bonding agent for mutual bonding of parallel fibers, does not form undesirable resin blocks and has a substantially uniform texture in the planar direction, unlike conventional products including parallel longitudinal fibers bonded with lateral fibers for connection.

As a result, a reinforced plastic molded product including the fiber reinforcing sheet does not cause a decrease in strength caused by localization of the bonding agents (see Fig. 5), unlike conventional products.

Furthermore, the fiber reinforced sheet can be produced by heating and pressing heat-bondable sheets on the surfaces of the fiber sheet; hence, the production cost is significantly low that of conventional process and can produce uniform products.

4. Brief Description of the Drawings

Figs. 1 to 3 show an embodiment of the present invention; Fig. 1 is a partial enlarged cross-sectional view; Fig. 2 is a partial enlarged isometric view separately

showing a fiber sheet and a heat-bondable seat; and Fig. 3 is a sketch showing a production process.

Figs. 4 and 5 are an isometric view and a longitudinal cross-sectional view, respectively, of a conventional example.

Table of reference numerals

A: fiber reinforcing sheet

1: fiber sheet	1a: continuous fiber
2: heat-bondable sheet	3: bobbin
4: guide bar	5: guide roller
6: pressure rollers	7: scrolls
8: hot roller	9: winding scroll
50: longitudinal fiber	51: lateral fiber
52: bonding agent	

Applicant: Nippo Sangyo Kabushiki Kaisha

Agent: Attorney, Akifumi MATSUNAMI

ENGROSSED DRAWINGS

FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

AMENDMENT (FORMALITY)

June 27, 1990

To: Commissioner of Patent Office, Fumitake YOSHIDA

1. Case Number

Patent Application No. 2-30907

2. Title of the Invention

FIBER-REINFORCING SHEET FOR REINFORCED PLASTICS

3. Person that submits the Amendment

Relationship to the case Applicant

Address 23-28-701, Esaka-cho 1-chome, Suita-shi, Osaka

Name Nippo Sangyo Kabushiki Kaisha

Representative Yuzo OKAYA

4. Agent postcode 460

Address 19-4, Chiyoda 2-chome, Naka-ku, Nagoya-shi

Name Attorney (6866), Akifumi MATSUNAMI

5. Date of Request for Amendment

May 29, 1990

6. Subject of Amendment

Figs. 1, 2, 4, and 5 in the attached drawings

7. Contents of Amendment

As in the attached sheets.